engineering laboratory

Enabling the Digital Thread with the Quality Information Framework (QIF)

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Overview

- What is QIF?
- NIST work on QIF
- QIF and Smart Manufacturing

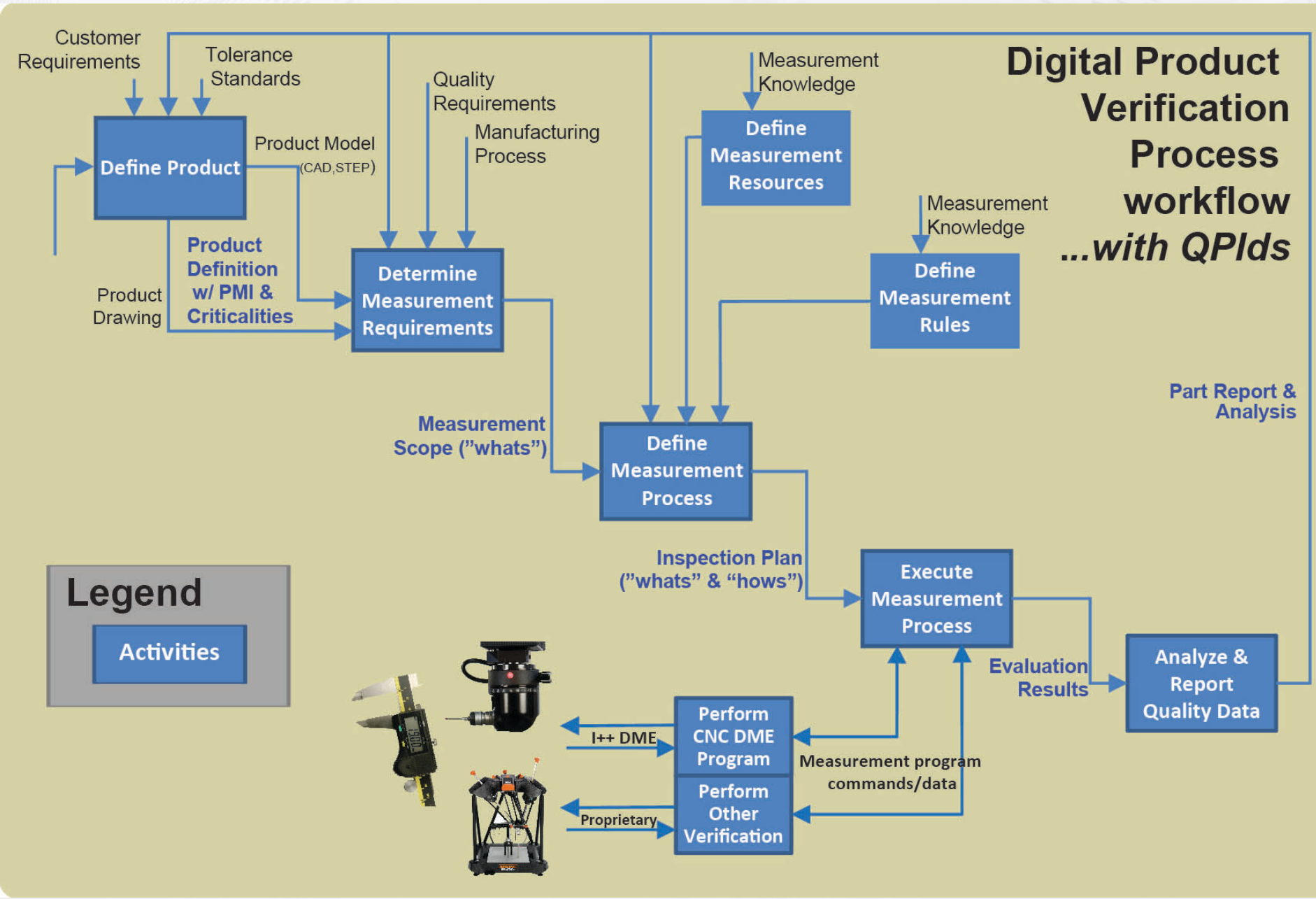
What is QIF?

QIF™
Quality Information Framework

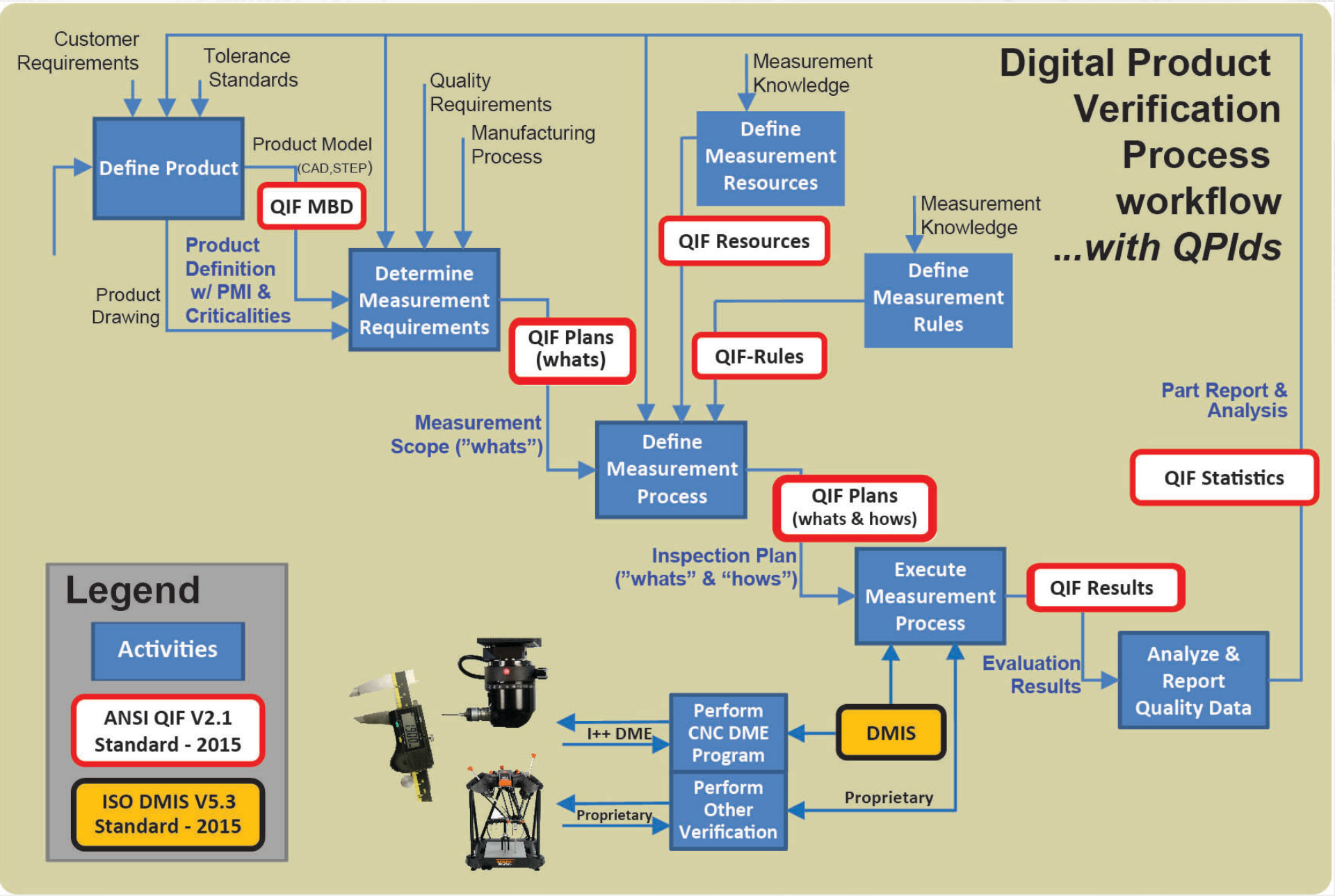
- A digital definition of quality measurement information
- Approved by ANSI, QIF 2.1, in Feb. 2016
- Defines information elements between all key activities in the digital product verification process workflow

ANSI

Digital Product Verification Process workflow ...with QPIds



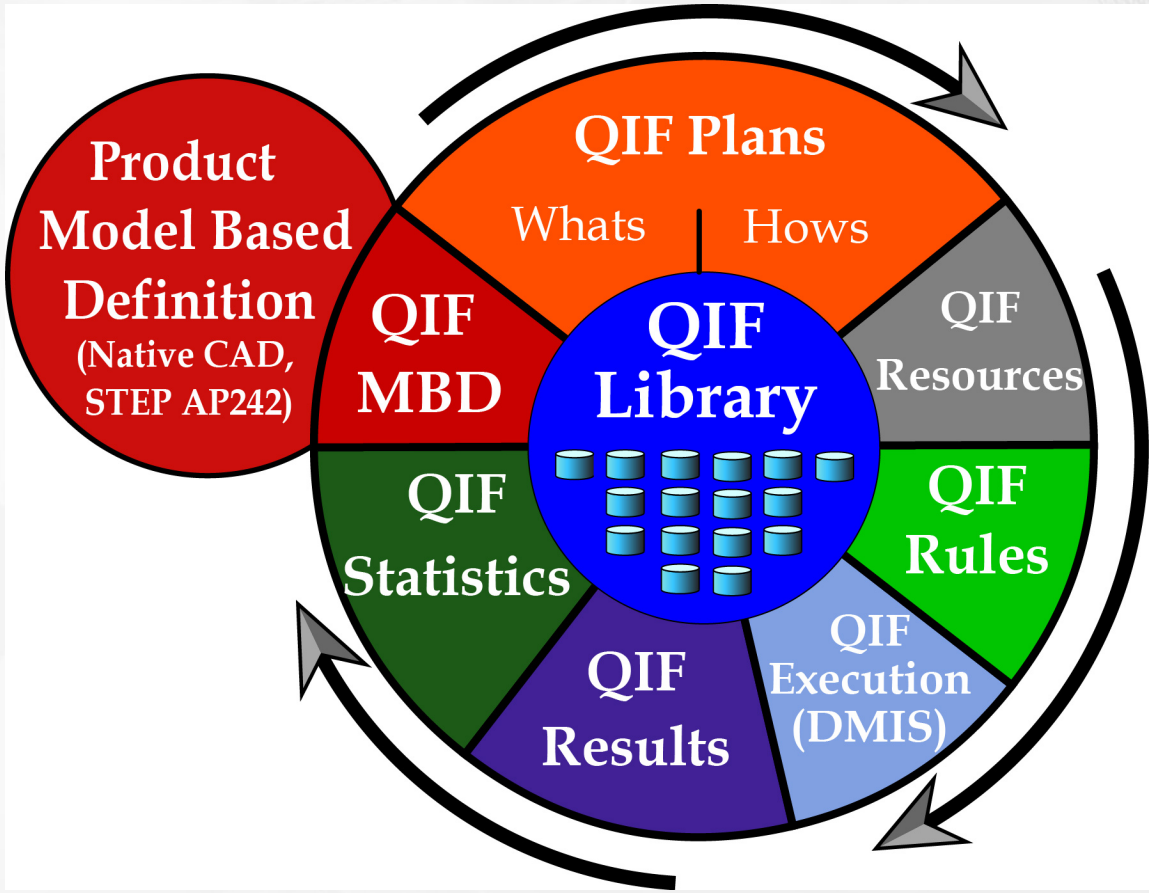
Digital Product Verification Process workflow ...with QPIds



Structure of the QIF Standard

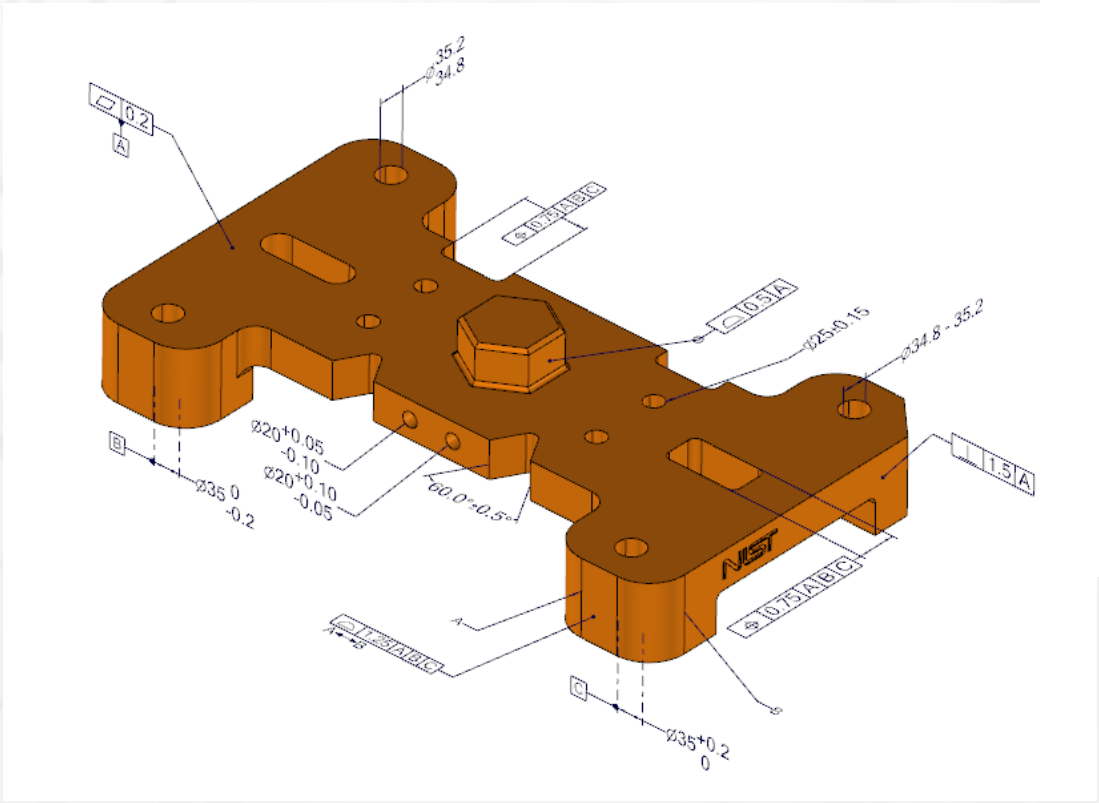
An integrated **framework** of quality information with all common elements in the **QIF Library**

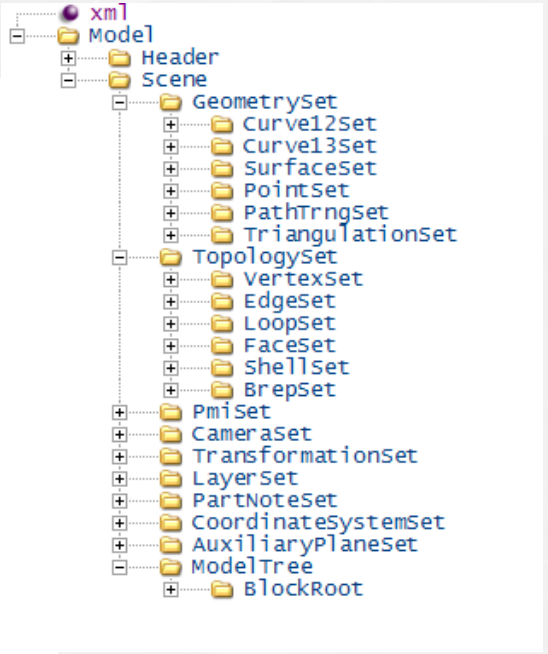
- **QIF Library** - all common elements
- **QIF MBD** – model-based definition
- **QIF Plans** – measurement planning
- **QIF Resources** – definition of measuring equipment
- **QIF Results** – measurement results
- **QIF Rules** – measurement rules
- **QIF Execution** – measurement execution (DMIS)
- **QIF Statistics** – summary measurement statistics



Part 2: QIF MBD

QIF MBD defines CAD geometry with all PMI (GD&T) information semantically linked to the underlying model features, all defined in XML/XSD





Data Traceability and Validation in QIF

- QIF model quality certification
  - Supports digital signatures in QIF instance files for data quality “guarantees”
- QIF validation mechanisms
  - XML schema for syntax checks
  - XSLT for more semantic checks
  - Annotations for manual semantic checking

What has NIST been doing on QIF?

- QIF digital model development and maintenance
  - XML, XSLT, annotations
- QIF validation with documentary GD&T standards
  - QIF supports ASME Y14.5 1994/2009 and the various ISO GD&T standards, particularly elements most used in practice
  - QIF supports with supply chain inspection reporting standards/specifications, SAE AS9102A&B and AIAG PPAP PSW
- QIF validation with digital CAD + GD&T standards and formats (STEP, JT, 3DPDF)

What has NIST been doing on QIF?

- Documentation
  - User's guides for various use cases
  - Natural language annotations in the QIF schema
  - Technical reports
  - Archival papers and presentations
  - Version road-mapping
- DMSC leadership
  - Board membership, working group chairs
- Currently using QIF with STEP-NC and Mitutoyo with real and virtual metrology

What has NIST been doing on QIF?

- QIF implementation verification
  - Public verification demonstrations @ IMTS 2010, 2012, 2014, and 2016

QIF enables Smart Manufacturing

- Will enable data observatory, model certifiability, model traceability
- Ready access to certified and traceable elements in QIF enable smart queries and integration/interoperability between digital information elements in the lifecycle, in spite of disparate formats across the lifecycle
- Several QIF capabilities enable the following use cases
  - In-process metrology
  - Measurement simulation
  - Digital measurement rules
  - Digital measurement resources
  - Measurement statistics

Realizing benefits from QIF

- Join the DMSC to progress QIF: (http://dmisstandards.org/)
- Manufacturers: Require QIF in your procurements
- Solution Providers: Implement QIF in your software